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ORGANIC GARDENING—Emmaus, Pa.

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With The Editor

The Theory Underlying The Composting Process

MAKING compost is an art rather than a science. To go about it mechanically, merely following rules, not only will not yield the best results, but the work will not be as enjoyable. We must understand first of all that composting is a process in which bacteria, fungi and other microscopic organisms assume the main role. While there are chemical changes in the heap, it is essentially a biological process.

The first thing to bear in mind is that the microbes playing a part in the composting process must be fed properly on food furnished by the manure and green matter of which the heap is built. Manure especially supplies nitrogen for the bacteria to feed on while breaking down the cellulose. They need phosphorus and potash too, but in much smaller quantities, possibly only 10% as much. They get these from both the manure and the green matter.

There must be proper working conditions. As soon as the heap is made, a very strong fermentation occurs, and the temperature goes up to about 160° Fahrenheit. It stays at about this point for quite a while and then gradually goes down to 90°. The question is sometimes asked, "If a temperature of 150° or more will kill bacteria, how can decomposition be brought about with bacteria playing such an important part in it?" The answer is that as the temperature varies, different kinds of microbes come into action. There are certain kinds called thermophilic bacteria which can withstand very high temperatures and some groups of actinomyces ray fungi develop when the temperature goes above 150°. At certain stages, especially at the beginning, the fungi take a more prominent share in the work. After the second turn the bacteria become the most active because the temperature has declined and come into their range. At this stage they are anaerobic, that is, they do not need air. For this reason air holes need not be made in the heap after the second turn.

It is remarkable how versatile nature can be in the processes of the compost heap. At various stages she uses different forms of bacteria and fungi. But very little is known about the exact functions of each, and much additional scientific study is needed.

A good deal of thought has been given to methods of stimulating the biologic life of the compost heap. One scheme is to douse the heap from time to time with water rich in soil organisms, which is obtained by soaking rich garden soil.

Two pounds of soil is shaken up in four gallons of water and then permitted to stand for an hour. This idea will no doubt prove very practical for small gardens. The average farmer, however, will not have time for it.

Average raw stable manure is made of over 20% bacteria, which comes from the animal's digestive system where they were used to break down food. If fresh manure is used in the heap, that should be a sufficient start. You can also strew some old, finished compost in a new heap as it is being made; the old matter will be full of biologic activity.

If a compost heap is made right it should begin to heat up in a few days. You can stick a metal rod into the heap and then check to see if it is warm when you pull it out. Another sign that the heap is warming up is that vapor will be seen coming out of the aeration holes. This is not a danger sign as some suppose. If you want to be technical about it you can mount a thermometer at the end of a stick and take daily readings.

Within a few days from the start, the temperature should reach about 160° and stay at this point for a few weeks. You can imagine the effect on weed seeds of such intense heat and moisture combined. The proper temperatures are necessary to insure the working of the different microbial elements at the various stages in the process of fermentation. If the temperature conditions are not satisfactory, the biologic routine will get out of kilter and the wrong organisms come in and upset the process.

If decomposition is unduly delayed because of the upsetting of the temperature conditions there may be a loss of nitrogen. In order to assure the quickest initial heating up, fresh stable manure should be used. I have seen cases where old manure was placed in the heap with disappointing results. Where a heap is made principally of very coarse straw there may be too much aeration with not enough heating. On the other hand where material like leaves is packed too thick there will not be sufficient aeration, which will retard heating. Where the temperature gets too high you don't have a biological decomposition and the microbes do not seem to perform their functions properly.

During the first eight weeks, air is needed in the heap to insure that decomposition is effected by fermentation and not putrefaction. That is why the materials must be arranged loosely, although as stated they should not be too loose. If possible do not stand on the heap as it compacts it too much. Oxygen must be able to get in so that the right kind of microbes can do their work. Without air at this point the right kinds of fungi and other forms of life cannot live and the pile is apt to turn acid. It is extremely important to aerate the heap during the first eight weeks, so that oxygen can penetrate easily and carbon dioxide escape.

In making aeration holes some people take rye straw, corn stalks or broom sedge and make it into bundles about four inches or more in diameter, tied loosely so as not to be too compact and stand one of these in each place a ventilation hole is desired. Those who prefer this method claim that holes made by a crowbar cave in.

After the second turn, as we have noted, aeration is not needed. The fungus stage is over and the material has darkened. From this point on anaerobic bacteria take over. (Those that need no oxygen).

If the heap doesn't sink in a few weeks it is a sign of poor aeration

and that action has slowed down. Another bad sign is an odor of ammonia emanating from the heap which may mean that the heap is too tightly packed. A too wet condition will cause the same thing. It is best in such cases to make the heap over again. Do not allow weeds or grass to grow on compost heaps. Their roots cut off the supply of air.

The water requirements of compost heaps depend upon many factors. If you are in a region of high rainfall you may not need to add water at all. In a dry country or in an excessively dry season you will have to water it from time to time. When watering use a gentle spray so as not to disturb the general arrangement of the heap. During the process of making the heap, water should be applied from time to time, but do not permit it to get waterlogged. It should have the wetness of a squeezed-out sponge. When you see water running away from the base of the pile it is a sure sign of over-watering.

In some regions of excessive rainfall the heap may have to be protected with a grass thatch roof which may be used for a few years and then itself composted. Too much water interferes with aeration and may turn the heap to a black ill-smelling peat instead of humus; this has a much lower fertilizer value. An excellent scheme is to cover the heap with burlap sacking or a heavy mulch of straw.

The failure of the heap to settle is also an indication that it is too dry. If you are checking your temperatiure carefully and find that it goes over 150° the heap should be given a thorough wetting. If the heap is allowed to become too dry, fermentation gradually ceases and the compost takes much longer to mature, with a loss of many valuable nutrients. When heaps must be some distance from the water supply, you are, of course, at the mercy of the climate. Excessive dryness also encourages the wrong kind of fermentation. The presence of ants or wood lice is an indication of dryness.

It is a good thing under certain conditions to place a straw mulch over the top and sides of the heap to a thickness of seven or eight inches to prevent excessive drying out by the sun. Other advantages are that it does not permit weeds to grow and it catches much more of the rain and keeps the earth moist under the mulch. Earth-covered heaps cake up in dry spells, and when a rain comes, it washes the earth off the heap.

Where rain-water is not sufficient the question arises as to the quality of water available. Rain is a saturated solution of oxygen and contains other valuable elements too such as carbonic acid, nitric and sulphuric acids—all in a beneficial form manufactured by natural forces. Rain picks up dust, micro-organisms and many valuable minerals. For many miles inland from the sea, it contains sea-salts and iodine. Therefore, rain-water is best for watering compost heaps. Pond-water also is excellent unless it happens to be polluted by factory or other wastes. To accumulate sufficient rain-water in barrels is a problem. In some cases rain from barn roofs is saved for this purpose.

The small gardener who has to use city water is up against it in many cases where the water is treated with chemicals. Such water lacks oxygen and the other factors of rainwater. The proprietor of a certain fish-market who keeps freshwater fish alive in tanks relates that on the day when the water-works "treats" the water with chlorine all the fish die. Fishermen who keep live minnows as bait, use

rain water for the same reason.

Melting snows on compost heaps furnish nitrogen and phosphorous, as well as other valuable elements. That is one reason farmers like to see snow lying on their land in winter—and why it is called "poor man's manure".

Occasionally, people ask whether dish-water is good for compost heaps. Such water too often contains strong materials and greasy matter which impedes aeration.

Compost water is excellent for watering seedlings and for other uses in fine gardening. It is made by placing water and finished compost in a barrel and then using such water. The compost can be used over and over again, but occasionally a little new compost should be added to strengthen the solution.

There is very little that can be said about turning the heaps except that the dates for turning be adhered to as closely as practicable. The first turn is in three weeks, the second is five weeks after the first. These dates need not be followed to the minute, and may vary slightly depending on the weather or individual conditions. It is advantageous if the turn is made on a rainy day. It is advisable to have the dates noted on something that is stuck into the heap, especially if you have many of them.

In order to do away with weed seeds, be sure, when making the turns, that all material that has been on the outside, is placed in the middle of the heap, so as to get the higher heat which is generated there. This should dispose of most of the weed seeds. In turning the heap it is not necessary to preserve the arrangement of the material as far as the different layers are concerned. After the first turn, make the aeration holes again, but not after the second turn.

Because of the fact that fermentation brings about an acid condition under which the micro-organisms cannot do their work effectively, it is necessary to provide a neutralizing base, something which will counteract acidity. Earth mixed with lime or wood ashes is ideal for such purpose. Where lime and wood ashes are not available, earth alone may be used. It requires a mere sprinkling, not over ⅛ inch thick and the earth should be topsoil rich in bacteria, fungi and humus. The earth helps to bring up the temperature. Without it, a satisfactory temperature will not be attained. Don't use soil from orchards or land where heavy poisonous sprays have been applied. Such earth will probably retard the action of the heap.

Suitable earth may be obtained along ditches and roadsides where topsoil is washed by rains. Soil from the woods is somewhat acid and needs an extra dressing of lime. There is much earth to be got from under chicken houses or where foundations for buildings are being dug out. On farms earth may be secured from lanes and replaced with stones, rakings and coal ashes. In an exceptional case sand may be used, especially if it contains a lime base.

A rich form of earth may be obtained by farmers who have livestock and who bed them on earth. After this earth has been in use for quite a while and thoroughly impregnated with urine it is removed and used in the compost heap. It is replaced with other soil and the process repeated.

Some old compost may be used in place of earth if none of the latter is obtainable, but earth is best as a neutralizer of acidity. The old compost is rich in bacteria, however, and will aid the biological life of the heap.

J. I. RODALE.

Agriculture And Health

By SIR ALBERT HOWARD, C. I. E., M. A.

To the Editor of the
Medical Press and Circular
Sir:

I should like to comment very briefly on Mr. D. P. Hopkins' letter on the above subject in your issue of May 9, in which he asks: 'Does anyone seriously doubt that superior health would not also be produced on a comparable diet and under comparable conditions if the produce was raised with some help from fertilizers?' Our best nutritional experts are quite convinced that such produce is not worth eating. Their verdict is deliberate, final, and crushing.

Such expert testimony is easily obtained. Take any average permanent pasture under the turf of which humus is constantly being made by natural agencies. Divide it fairly into three equal strips: manure the middle plot with a conventional dressing of mixed artificials containing sulphate of ammonia; treat the two outside plots with an equivalent amount of freshly prepared compost made from animal and vegetable wastes. We shall then have a comparison between humus supplemented by chemical manures and humus alone.

Everything will soon be ready for the verdict of our best experts on nutrition—not statistically minded bipeds, as we might at first expect, but quadrupeds in the shape of the grazing animal. The animals will concentrate on the two humus areas and graze the herbage down to the roots; they will only lightly pick over the produce of the poisoned soil.

That the middle strip has indeed been poisoned will be evident from the response of our chief soil conditioner—the lowly earthworm. These creatures will leave the plot treated with sulphate of ammonia, but will multiply in the two humus-filled areas. This can be determined by a simple examination of the upturned turves, or better still by counting the molehills on the three plots. Earthworms, as is well known, provide a part of the food of the mole. Often, when these animals pass from one of these humus plots to the other, they go straight across the artificially manured area and seem to know by instinct that they are not in one of their usual feeding grounds. Consequently fewer molehills are to be found on this strip.

A word is necessary at this point to emphasize the importance of the earthworm in providing our crops with food. The casts of the earthworm are exceedingly rich in available nitrogen, in available phosphate, and also in available potash; the roots of crops are always attracted to these casts and penetrate them in all directions. But the method of manuring advocated by Mr. Hopkins would ensure the destruction of this section of the farmer's unpaid labour force and its substitution by the purchased contents of the manure bag.

It is impossible within the limits of a letter to present the whole case against artificial manures and to

show how a highly industrialized island like Great Britain could in a few years feed itself by the faithful adoption of the law of return and even begin to export food. This task I have attempted in *Farming and Gardening for Haelth or Disease,* which is now in the press in this country and also in the United States of America. This latter country is rapidly forging ahead in the war in the soil, in which many of its medical men are doing yeoman service. In the British Empire, South Africa undoubtedly leads the way as will be evident to anyone who follows the activities of the recently formed National Veld Trust and the progress that has been made in converting the wastes of the towns into humus and returning them to the soil which feeds them.

If I were asked to sum up the humus campaign in a few words I should reply: Artificials have had their poisonous day; the basis of the public health system of to-morrow will undoubtedly be fresh food from fertile soil.

Sir Albert Howard.

Readers Write

"A GREAT many people here have lost their potato seed from rotting in the ground. They cut the seed and chances are, they did not let them dry before sowing." Jim Allen, West Plains, Mo.

—o—

Regarding compost: our experience is contrary to many of the questions I note in your magazine in that we find the heaps we are making to be fully composted in much less time and turning than general, other experience indicates or is suggested in the directions for making the heaps. Green material used is all garden and orchard refuse such as tomato, potato, bean and pea vines, leaves, weeds, rakings, clippings—in fact everything of that type is used, plus refuse alfalfa and lima bean straw from milk goat pen (all uneaten feed from mangers is used as bedding and of course urine soaked and mixed with manure); this is interlaid as suggested with a couple of inches of sweepings from chicken and duck pens (cleaned daily) and inch of top soil, plus occasional layer from adjoining finished compost heaps. Many times in turning heaps a second time, the entire lower half or more appears fully composted. Perhaps the fact that a large portion of our material is already well mixed and the manure is green and heats readily, plus the warmer climate and the fact that we cannot depend on rain, therefore keep it moist regularly with a hose hastens its maturity to that extent. For ventilation, we use discarded tile drainage tiles similar to the "Petty Method."

Mrs. C. C. Collins, La Mesa, Cal.

—o—

"In your July issue you mention spruce needles. The new shoots of spruce are used as a tea by some of the Northern Indians to combat scurvy. I think I have this information from my brother who hunted a great deal in Canada."

A. F. A. Konig, Bradenton, Fla.

Return To The Land

III. The Evolutionary Principle

By HEINRICH MEYER, PH. D.

IN a recent issue of *The Bulletin*, Men's Garden Club, a writer expressed his concern over the organic school which "seems to be fast gaining ground". The writer thinks or, at least says, that the advance section of this school "advocates no commercial fertilizers of any sort—only compost developed with a sort of witches'-blood secret formula". He also seems to think that organic gardeners are down on limestone and that the organic idea constitutes a "new-fangled notion." Assuming that the involuntary humorist is half sincere, the last slip should not even have occurred in a moment of severe anger. For nothing is older than the idea of organics. It is nature's own method. If it is again gaining ground, we should be glad for the increasing sensibility of the gardening world. After all, how long have synthetic chemicals been applied? A bare hundred years. How long have plants succeeded on organics? Billions of years. If it were, as the nettled Bulletin-writer says, that inorganic fertilizers may have advantages for some purposes just as organic fertilizers have for others, the plants would have had to wait a very long time in their own history until modern chemistry came to their help.

Let us look at the record before we admit any argument in the case: Plant evolution took place in two ways: The plants used as their basis the natural soil as it developed from weathering rocks or windblown and water-moved sediments. To this, however, was added the residue of previous plant growth and animal matter such as occurs in nature; insect bodies which amount to tons in an acre of land, earthworm casts, amounting in samples tested by Lunt and Jacobson to eight tons per acre, animal bodies, etc. And also the variable amounts of living micro-organisms, of which Loehnis computed 360 lb. of bacteria in the upper 2.5 cm of an acre. Such a soil enriched with organic matter was available for natural plant growth and for the evolution of all the present plants on earth.

While the plants thus got along by themselves, successfully as the result shows, there was no need for soil conservation. But when man came along and started to impose his will on natural growth, everything went wrong: The soils lost fertility. The plants lost vitality and began to "run out". The plants became subject to epidemics and parasites, fungi and insect pests; and all other damaging factors increased.

It would be wrong to attribute this unfavorable response of our crop plants to man merely to the use of synthetic fertilization; a major cause is of course, as we have often shown, the willful neglect of nature's rule by imposing a system of mono-cropping without allowing for natural succession of crops by adequate rotation. For in nature a continuous migration of plants

brings about long-range rotations. Still, the fact remains that man's wrong system included artificial fertilization, such as the plants had never experienced in their previous history; for *that* they were *not* equipped. To chemical fertilizers the plants were not adapted in their previous experience of billions of years.

The organic school does not say that no fertilizers should be used. In fact, all fertilizers that do not disturb the life of the soil have been recommended by us whether they are of organic or rock origin. The organic school only maintains that plants should be grown naturally. If unnatural soil conditions are created, we hold, the plants respond by disease or susceptibility to disease and pests. And furthermore, we say, the plants that are unhealthy are also unfit for food. For unhealthy plants produce unhealthy animals and men, who, after all, also evolved more or less successfully on natural foods.

This latter statement is sometimes considered arbitrary by those who have accepted the tenets of the chemical school as it existed a hundred years ago and as it resulted in our fertilizer industry. This industry is, of course, greatly overrated by some. Mr. Aries of Yale University recently pointed out in an address before the Northeastern Wood Utilization Council that only 20 per cent of our total crop production can be attributed to fertilizer use. All over the world, the figure would be much smaller if only strong synthetic fertilizers were measured. Still, this is not a question of principle. The really decisive question is: *Do chemical fertilizers actually change the constitution of a plant?*

The greatest authority in the realm of inorganic plant nutrition in the United States is Professor D. R. Hoagland of the University of California. In his Prather lectures read at Harvard University and published in 1944 under the title *Inorganic Nutrition of Plants* (Chronica Botanica), he states that "the real problem of plant nutrition from the point of view of the plant is not, strictly speaking, a problem of inorganic nutrition, but one of organic nutrition."

For something like the last three decades, research in organic plant nutrition, in soil colloids, and related subjects has been conducted with modern methods. Previous analyses are to a large extent doubtful, and the big collection on plant chemistry which Czapek worked out in three volumes is now often useful only as a guide to the literature. In other words, there is much more to be learned than is already known. But enough research has been carried on both from a strictly scientific and a practical point of view to show that the organic thesis is sound. It is an established fact that a plant may grow and look like another, yet be of an entirely different chemical make-up depending on the feeding it received. Thus the food value of a crop may be vitally affected by fertilization.

We first refer to some of the older experiments by Opitz on potatoes, because they are published in Aereboe's big Handbook that is available in the larger libraries and because they fit in well with the Rothamstead experiments. Opitz and his school showed that the starch content and storage quality of potatoes went down as the amount of chlorine in the soil went up. Chlorine is, of course, a constituent of the synthetic fertilizer ammonium chloride. This is one reason why potatoes are best fertilized with organic materials, as is the common practice in many

parts of the world. But the theoretical importance is this: Potatoes do not require for their growth the amount of chlorine which they take up from the soil and store in their tubers. They simply cannot select. They have no choice, they grow and yield heavily, but their tubers are changed chemically. Now, with the starch content goes their metabolism. On it depend to some extent the power of suction and the rooting habits as well as the ability to utilize soil moisture. Thus the quality of the potato seed is vitally affected by the use of fertilizers containing chlorides. On the seed, of course, depends the quality of the next generation of plants and how they will respond to unforeseen conditions, or the health and vitality of the potato strain.

A more recent experiment of equal significance was conducted by Vickery, Pucher, Wakeman and Leavenworth at the Connecticut Station and published in 1940 as Bulletin 422. The researchmen investigated tobacco plants in their response to different nitrogen fertilizers. Their findings were summed up by Hoagland as follows: "The effect of increasing the proportion of ammonia to nitrate nitrogen in the culture solution produced a profound decrease in the concentration of organic acids in all parts of the plant. Malic and citric acid were most sensitive to change in cultural conditions. It is noted that *in certain treatments the plants were of the same size and appearance, yet were chemically different* as regards the organic constitution of the sap." We underline a pertinent passage because it says exactly what *Organic Gardening* has maintained so often: You have two tobacco plants, they look alike, but they are very different as to the constituent elements, and the scientist can show that the difference is due solely to the method of nitrogen nutrition. This is something very important.

It has, of course, been known for some time that tobacco is highly sensitive to mineral fertilizers. An excess of mineral matter makes for an entirely different leaf. As a result tobacco is a highly specialized crop: Heavy soils produce a dark leaf, small, but rich in aroma; sandy soils with low mineral content produce a light leaf suited for wrappers. Burley grows on Kentucky soils rich in phosphates. And if you apply a potash fertilizer, such as muriate of potash, you get a nice-looking plant, but it does not produce a good smoking tobacco: the burning quality is reduced and the leaf is apt to become coal.

If the plants were altogether endowed with the power to select from the soil that which they need, they would be the only organisms that can do so. If such a power of choosing their food existed, they would, of course, be rather limited to a special suitable soil, where exactly the right food is present. But plants like all organisms, must be adaptable; they must be able to take up almost anything so that perhaps they can utilize it. Consequently a sugar beet contains minerals that, from all we know, are not necessary for the plant, because other sugar beets do not take them up. Yet, is this very different from man? Some like onions and others despise them, partly because they have not accustomed their systems to digesting onions, partly because they obtain the same or similar nutritive elements from other foods. How much we can replace one food element by another, nobody knows. Everybody has his own system and can find out for himself. There can be no general rule. Just think of the people who can eat everything without gaining weight; their metabol-

ism is high. This means, they can burn up foodstuffs more quickly. They are often apt to be wiry, nervous, thin-boned, inclined to calcium deficiencies and bad teeth, and possibly given to flatulence. Thus their excess water is eliminated in liquid or gaseous form while their starches are burned up. On the other hand, you have different people who combine water and starch and store it up as fat. Nobody really knows why. For if you look at a few glands and attribute everything to them, you would also have to find out why these glands work so differently; they are after all not prime movers but parts of the organism.

Sir Albert Howard's article in this number points out the wisdom and choosiness of animals. It is, furthermore, a well-known fact that grazing animals dislike the grass grown over manure droppings; it has also been established that pigs allowed to feed with self-feeders make a wise choice, use less feed, and gain better weight. But it is likewise known that every individual animal utilizes various feeds differently. The experiment work that went on at Halle on available nutritive qualities of various animal feeds showed a wide range as to different animals of the same age and type.

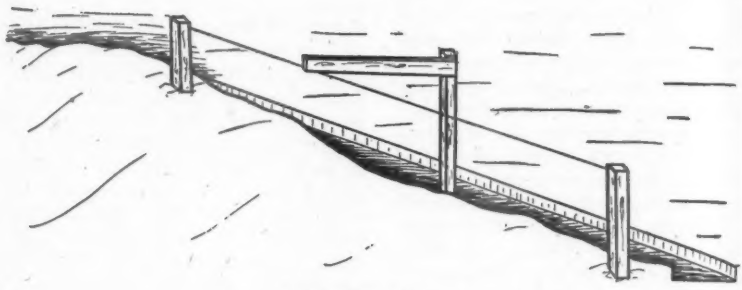
As to plants we know even less. But one thing is certain: Just as our ancestors had better teeth in the average than we do, just so did plants of the past have no problem of constant complicated adjustments to synthetic fertilizers. Compare with dairy cows. You cannot get the feed to which they are accustomed and you see immediately a decline in milk yields. A plant is different in that it cannot choose so freely; there you supply large quantities of ready mineral plant food. They pick it up contrary to their natural history. For in past ages they grew, survived, and reproduced, in fact, *they evolved under a system which was defined entirely by natural, non-chemical soil conditions and by the presence of organic matter.* Nor did man in the past demand such big crops from his soil; there was no need for it, nor was the equipment handy for mass-cropping. Besides, hybrid plants with their great demand on soil fertility were not in common use. Plants grew and adjusted themselves gradually. Organic, living soils offer the nutrition to which they are adapted. This is their natural system.

Only a fool would believe that modern cropping practices can go on forever without destroying the humus content of the soil. Yet without humus, no chemical fertilizers need be considered; for without organic matter, no soil is alive. Man felt for a short while very proud of being able to supply three major plant foods in chemical form; it looked as though this method would allow constant cropping and constant yields. But the average yield per acre sank continuously until yet another strategy was tried on nature: The constant re-introduction of new crops of special hybrid breeding. This method exhausts the soils even more quickly and is just another one of the makeshift methods of modern civilization. Thus, if we would find out what is the natural long-range course, we need only ask ourselves: How did plants develop in the past? What is the lesson the last million years can teach us?

There is nothing "new-fangled" about organic gardening and farming. It is very old, it is the way of nature under which plants developed. Suppose you were suddenly taken ill. A physician is called in.

He says: "I do not know what you have. But I have a medicine which is in some cases extremely powerful. It may kill you, but it may heal you. Do you want to take a chance?" Of course, no physician would say so; but most patients would reply: "If you do not know what it is all about, I certainly will not take a chance, but rely on nature." Reliance on nature is based on past performance; trying out a modern formula is a mere gamble. We do not know much about chemical facts determining plant nutrition, but we do know that *natural* plant nutrition made present plant life possible. Science will seek new answers, but nature alone *has* them. And it is good that plant physiology and modern soil science as well as colloid chemistry in general tend to prove the soundness of the natural method: Return to the land the residues of animals and previous plant growth if you want healthy plants! Or: Follow the principle under which our plants have naturally evolved in the past.

Gardening Devices



MAKING A DITCH

THE PROFESSIONAL GARDENER likes to plant straight rows that make cultivation easy. The amateur gardener who has time is likely to make his beds irregular in order to have a more interesting and less utilitarian garden. He may even change a bowl of land into a prettily terraced showplace. But in either instance the question may arise: How am I to draw a level ditch? The picture shows you: You make a level guide line on the side. You nail two pieces of wood together at a right angle. Then you dig along and use the angle to correct your eyesight.—If you do not have a water-level, you can always use a glass with water—at least for gardening purposes. The stand of the water under the rim of the glass must be even.

Two Oldfashioned Flowers

By DORIS CLARK

WALLFLOWER

IF you ever planted too many radishes in spring and could not eat them as they grew to juicy perfection in an always surprisingly short time, you may have let them go to seed. Incidentally, radish seeds make quite a nice edible titbit—radish concentrated, so to speak. Anyhow, the stalks of radish flowers expanding their blossoming parts in shades of white and bluish-pinkish hues are quite attractive amid the slenderer blossoms that grace the beds at the same time. To me dill and radish flowers seem to belong next to each other. If you inspect a radish flower, you notice that, different from most others, it has only four petals which stand crosswise and indicate family relationships with other similar plants.

Among the weeds there are, for example, penny cress, peppergrass, shepherds purse, and among the flowers you have stock and wallflower. The *wallflower* is better known in this country as *Cheiranthus,* which literally means handflower; this indicates its popularity in certain parts of the world where it was carried in the hand as a nosegay. Nosegay is a funny word, but when you analyse it, rather poetical. To me who am endowed with a particularly sensitive nose, the fragrance of the wallflower comes first after the rose and next to the very different *mignonette.* Then I should have *carnation, stock, violet,* and *lily-of-the-valley.* Wallflower and stock have some of the violet's sweetness, but enriched with a golden honey mellowness that makes the scent warmer and less powerful.

Cheiranthus and *erysimum* are so closely related that they frequently appear in the catalogues as annual and biennial wallflower. But as I look at several books before me, I am surprised to find the information on wallflower not in agreement with my experience. The description of the colors is very good; there is a great variety from light yellow to deep purple, though the commercial seed almost invariably

produces a golden yellow flower, rarely having a plant with the darker shades. But the report that the wallflower blooms in spring is incorrect. If you sow the seed as it comes out of the package in your garden in March, your plants will, at least in the medium temperature zone of Emmaus, Pa., bloom in June and July, which is generally called summer. They bloom almost invariably the first year. The bi-

ennial form, to which the books refer, is much less commonly found. It is the one which you sow like hollyhocks in one year to get blossoms the next. But there is nothing in your way to have the common wallflower annual in fall, winter or spring, if you watch out that you give the plant about three to four months growth. It does not care much about special conditions. It grows successfully in a wet year in the North and it causes no trouble in the hot Gulf coast area of Texas, where I grew it in years past. In this respect, wallflowers are more adaptable and cosmopolitan than stocks, which prefer the North. The only good advice I see is contained in Mrs. Bush-Brown's *America's Garden Book* (1943): It may be good to prick the plants a little so that they make a thicker growth because they are otherwise inclined to become spindly. But I personally do not mind spindliness because I never transplant my wallflowers. I use a packet of seed for the space of a small bed, the size of the kitchen table; and I intersperse a packet of some other flower, like snapdragon. When they bloom, gradually coming to full profusion, early in July, the bed is filled out perfectly, and the shades of the two unrelated flowers make a very rich display. Wallflowers growing tall through narrow seeding are also quicker bloomers. When you transplant, you get a shorter stockier plant with more flowers; but the flowers are then much later. So you have your choice.

Wallflower is not the proper name; for in reality the cheiranthus does not love the rocks; it prefers a rich humose soil, it loves compost; and it only demands the presence of lime. But never think even remotely of the poor girl who is left sitting near the wall of the festive hall where the popular crowd is dancing; the honey-rich wallflower of the garden is a self-assured woman who need not ask for favors. I should only pity those who have not enjoyed her fragrance and color until now.

Mignonette

Many years ago, I read in a garden book that some famous gardener whose name I forgot was asked what he considered the best flower in the garden. I expected him to say *the rose*, but he replied *the mignonette*. Maybe, he only thought of annuals. In that case, it would be hard to take issue with him; for the fragrance of mignonette is as close to heaven as human senses will ever pertain. *Reseda odorata* is her Latin name, and I personally prefer reseda to mignonette. It sounds to me more dignified and less "cute". In the older English writers, the name of reseda, which is also the one used in France, Germany, and Russia, was by no means uncommon; but Lord Bateman who sent the seed from France in 1742 called the flower "mignonette" or "little darling." In French,

mignonette is as far as I recall a carnation.

The garden books say that mignonette is hard to transplant and should be sown where it is to remain. There is no doubt that transplanting checks its growth considerably and may cause one or two of the stalks to wilt; but from the axils new growths come up sooner or later. These, however, bloom late and do not produce the rich spike of greenish flowers with the reddish-brown spots that we get from the untransplanted ones. The difficulty in transplanting is that the reseda requires a shady spot and plenty of moisture; it is not enough to water, for it likes an air saturated with moisture. You want to plant it thickly and between taller flowers. This water-loving being has therefore the ability to stand up as a cutflower for considerable times, though its fragrance does not persist as long as its appearance. While cheiranthus is a perfect potted plant, reseda is an excellent cutflower.

This attractive plant is again a flower that demands little attention otherwise, though it cannot be grown successfully in warm climates; but in the North you can throw seed out throughout the year and you may have flowers during most of the frost-free period. Then the plant reseeds itself and becomes firmly established like petunias and other annuals that return, once they were introduced. Mr. Anderson tells me that in his childhood he was told to weed a certain bed in the garden. He picked up all the young mignonettes because they looked so much like weeds to him. So they do, and a little caution may be in place.

If you love the fresh fragrance of reseda, you can always preserve it by the oldfashioned method of placing fresh flowers, cut in the morning, in a jar with glycerin-soaked cotton. But I have never cared for such artificial preserves. I like to have my flowers in season. I always feel that there is some pleasurable anticipation in waiting for the first mignonettes to bloom. It is a discovery every year. The first bloomers are always rather modest in appearance, though no reseda will ever produce a particularly striking spike. But the uniqueness of these many little flowerlets on the tender juicy stalk is something no flower lover will wish to miss. And I always am on the lookout when the end of May is past: When will the first resedas bloom?

Number of Plants

HOW MANY different plant species exist in the United States? How many in Europe? How many in South America?

It is amazing to note the differences as we compare figures for flowering plants:

North America: 17,000. Europe: 10,000. South America: 50,000; Asia: 50,000.

The causes for this distribution are unknown; the figures are only rough estimates, and they do not include the great number of ferns, mosses, and other plants that never produce regular flowers.

Hints For The Victory Gardener

This is the thirty-fourth of a series of articles by this author dealing with the cultivation of ordinary vegetables.

ENDIVE AND CHICORY

By ROGER W. SMITH

MORE out of curiosity than anything else you may have bought, with your regular seed supply, a packet of seed marked "Endive". The picture on the packet showed a heading plant not unlike lettuce with serrated leaves. Before sowing the seed you may have paused a moment to read the instructions on the packet and to wonder whether the plant would thrive in your garden.

Endive deserves a spot in your garden. During the hot weather of late summer and early fall, when lettuce fails to give satisfaction, endive will thrive and provide you with an interesting and pleasant substitute.

Endive will succeed in any ordinary garden soil not deficient in humus and normal moisture. Like lettuce, its succulent growth must be rather rapid to enable it to form tender leaves. On poor, dry, exposed soil its growth will be slowed up so that its leaves, if they form in quantity, will be hard and unnecessarily pungent.

An excellent plan for success in endive growing is to use the same area where lettuce succeeded early in the spring. A thin layer of compost humus lightly dug in along the lines where the rows of endive are to grow will insure success.

Seed should be thinly sown, covered with not more than one-third of an inch of finely sifted, mature compost humus, clean sand, or a mixture of the two. To make easier the job of sowing, seed, sand, and humus may be well mixed first in a suitable container and the mixture spread in a narrow ribbon along the bottom of a shallow trench formed by drawing the corner of the hoe along a line indicated by a tight string stretched across the garden. The rows should be placed about one foot apart and the plants early thinned to stand one foot apart in the row.

Naturally, for a fall crop, seed must be sown in late summer. Growing the tiny seedlings during a time when the garden surface is hot and dry, has its difficulties. You may find it best to raise the plants in a flat or similar container set in a partly shaded spot, or by using a shaded seedbed. Flats and seedbeds may be protected from excess summer heat by stretching cheesecloth over them in some manner. This covering may be in the form of a small tent or an awning, either are easily built upon stakes driven into the ground around the seedbed. A removable slat roof, a frame a bit larger than the seedbed is a handy garden accessory. Such a slat roof is easily made. Across a reasonable firm rectangular frame of the desired size, laths are nailed with spaces about equal to the

width of the laths between them.

The flat should be built of boards thick enough to prevent the undue escape of moisture and have adequate drainage. It should be deep enough to hold three inches of a fifty-fifty mixture of clean sand and mature compost humus, plus a bottom layer of small stones or broken flower pots. In odd moments, or rainy days, you will have ample leisure to prick out the little plants and transfer them to flower pots or small containers as their demand for space increases. Seedlings of endive are usually ready for transplanting to the open garden when they are three weeks old.

Somewhere around this time, if you have sown seed during late summer, thunderous rain comes to soak your garden and fill the air with a fresh and earthy fragrance. After the storm clears is the time to set out your stock of well rooted young plants.

They should be set slightly deeper than they grew in the flat, be well firmed and protected against excessive heat if necessary for a day or two by inverted baskets. Usually such protection is not necessary. A little work with the hoe to keep down weeds, or a light mulching of straw or rough compost, is about all the cultivation the plants need.

Endive differs from lettuce in many ways. One of its striking differences is the slightly bitter, appetizing flavor of its leaves. This bitter flavor can be reduced sufficiently to make it a really pleasant and refreshing quality by blanching.

When the plant is about half grown and the head fairly well formed, the long outer leaves should be drawn up around it and tied together with soft string or a strip of muslin so as to cause them to exclude sunlight from the heart.

Some three weeks later you will be able to cut and examine the first blanched head. With some misgiving you remove the rough outer leaves and the string. In your hand you hold a heart of tight leaves delicately creamy or pure white, crisp, tender, and when you break one off and taste a bit of it you discover that it has a peculiarly pleasant flavor.

Blanching, the exclusion of light, may be accomplished in a number of ways: by inverted flower pots over the plants; by placing planks about a foot wide on edge so that they cover the row with a light-tight miniature roof. Unless you grow a very large number of plants it will probably be easier for you to tie up the heads.

Although blanching reduces the bitterness natural to the leaf, it also reduces its food value. The green, unblanched outer leaves so casually placed upon the compost heap are highly recommended by dieticians because they are rich in Vitamins A, B1, and C, and recommended as protective foods to ward off colds and maintain normal eyesight. The bitterness of these outer leaves can become a savory asset when cooked in soups with a "flat" flavor and with ordinary "greens".

This quality can also be used to add distinction to the ordinary salad-bowl.

In the fall as you gather enough, and maybe more than enough, endive to meet household demands you may wonder about the storage and winter use of the fine heads. It would seem a shame to let them go to waste.

Plants which reach maturity in late fall are commonly dug up with a good ball of earth around their roots and with as little disturbance as possible, and set in a dark corner of a cool, unheated cellar. Here the heads will soon blanch without the necessity of tying.

There are many fine types of endive from which you may choose. Cos type Batavian (100 days to maturity) has broad, flat leaves much like Broad-Leaved Batavian (90 days to maturity). Giant Fringed Oyster endive (65 days to maturity) has finely cut, lacinated leaves. Before tying up for blanching most of these plants form a rosette some fifteen inches in diameter.

And having grown your own endive and enjoyed it you may have wondered at the manner in which it resembled lettuce and the manner in which it definitely differed from it. Lettuce and endive belong to the same family as the dandelion. But endive, *Cichorium endiva,* is much more closely related to chicory, *Cichorium intybus.*

Endive is a native of the East Indies. It was introduced into Egypt perhaps before the days of recorded history. The heavy heading endive of your garden is more closely related to the common wild chicory, a weed familiar along most country roads and fields throughout the eastern states, than to the lettuce.

As a familiar, perennial weed, you will remember wild chicory because of its crooked flower stalk, almost naked of leaves, which reaches two or three feet in height and bears widely-spaced, sky-blue flowers some one-and-a-half inches across. So strikingly blue and persistent are the flowers of the wild chicory, it is often used to ornament flower gardens.

Your success in the growing of a few heads of endive may well lead you to a study of its wild form, of the beautiful blue flowers, perhaps to an amazingly different form, the "parsnip-rooted" chicories.

It seems likely that during the same long forgotten days during which ancient gardeners in the East Indies were developing a common weed into the heading succulent endive, others far to the west were working with a very similar weed because of its possibilities as a root crop.

Whatever may be the truth, the straggly, sky-blue-flowered weed so common along your roadside has two very valuable, cultivated descendants; the leaf endive and the root forming chicory. If you have enjoyed endive you might like to grow a row or two of chicory to provide you with exquisite salad bowl material during the very darkest hours of winter.

Chicory is a hardy plant not especially sensitive to heat or cold. Like other root crops it demands a deep, rich, loamy soil, well pulverized for the satisfactory formation of its penetrating roots.

Any well-dug, properly drained, garden soil is suitable but in most gardens it is best to incorporate quite deeply a moderate amount of mature compost humus so as to ensure normal fertility of the soil. Raw manure should be avoided for this, somewhat like stones, encourages malformed, pronged, useless roots.

Witloof Chicory (French En-

dive) requires about 100 days from the sowing of the seed to the maturing of the root. If seed is sown too early the plants are likely to "bolt"—go to seed—and form useless roots. It is better to sow a little too late than too early.

Seed should be sown thinly in drills eighteen inches apart and covered with about one quarter inch of sifted compost humus. The plants will develop their best roots if they stand about three inches apart.

Chicory requires about the same

cultivation as carrots, shallow but sufficient to keep down weeds. It is a husky plant, rather free from insect pests and plant disease, even so it will strikingly reflect any extra care you manage to give it. A little consideration such as a thorough soaking with water at the beginning of a prolonged dry spell followed by a light mulching of rough, partially composted materials will keep the plants thriving.

And so, during some sparkling, clear day after the first frosts have cut down your tomato plants and spread much blackness over your garden, but before the ground freezes hard, you dig out the long, heavy roots of the chicory. You wonder what to do next.

A good method is to place the dug roots close together in an upright position in a large deep box, having first removed the leaves. The crop of removed leaves, usually discarded, is very high in essential food value. It provides valuable greens when boiled in salt water which should be changed several times to remove the bitterness of the ripe foliage.

You may find it necessary to cut off the root tips of the longer roots so that the tops may be fairly level. The spaces between the roots should be filled with sand and a covering of about ten inches of the same material should be applied. The boxful of roots should be well watered, kept moist, and stored in a warm place, fifty to sixty degrees Fahrenheit.

Under such conditions the roots will form tight, blanched heads, known to the market as "Witloof". These will break through their covering of sand in about thirty days, at which time they are ready to be cut and harvested.

Under such conditions temperature controls growth. If the temperature is raised, the formation of the heads becomes more rapid but they are less tight. Coolness retards their formation. It is easily possible to keep a reserve of large roots in a cold (not freezing) part of the cellar ready for forcing when needed.

In the growing of chicory and

endive you must not overlook that delightful early spring type of chicory, Asparagus or Celery Chicory (Cicoria di Catalogna). This very pleasing form of leaf chicory has much to recommend it and it may be that it will eventually displace endive in popular favor when it becomes better known.

Asparagus chicory is sown, much like lettuce, in early spring. It is grown for the value of its young leaves. The head may be blanched or the leaves used green. Young leaves and shoots are very tender, celery-flavored, and make excellent salad-bowl material. The older leaves may be boiled much as spinach.

By then, of course, you will have discovered that chicory of the evil reputation "coffee chicory", the large-rooted Madgeburg type. The roots of this plant when ground and roasted have long been used to adulterate coffee. But for all its ill fame, when you grow it you will find Madgeburg chicory a fine plant. The younger leaves make excellent salad material. The large, heavy roots are undoubtedly very rich in essential minerals because of their deeply plunging nature. Much coffee chicory is grown to provide rabbit feed. No doubt it is very valuable for this purpose. How much of it is diverted into other channels is problematic.

A little packet of seed marked "Endive". From it you grew many fine salad plants. The growing of them may have increased your interest in the growing of closely related plants.

Neither endive or the various forms of chicory demand much. They are still very closely related to the weed with the sky-blue flowers. But success, in the final analysis, depends upon your ability to supply the necessary organic material in exactly that condition in which it will be most suitable to the plants which, from necessity, must survive upon it. Properly matured compost humus will provide this material and the understanding of its use will do much to aid you in success with these plant forms.

Seeds and Seedless Fruit

SINCE THE PUBLICATION of our various articles on seeds for human food, questions have come in about the food value of seedless fruits. Readers have suggested that the nutritive elements of the seeds might go into the flesh of the fruits that have no seeds. We checked up on this matter and received through the courtesy of Dr. Magness of the U. S. Horticultural Station at Beltsville, Maryland, some data and interpretations based on Harding and Fisher, *Seasonal Changes in Florida Grapefruit* (Technical Bulletin 886, 1945). According to this information *seedless fruits are lower in minerals than seeded fruits.* The Duncan grapefruit which carries plenty of seed was consistently higher in acids than the seedless Marsh, and the total solids of both varieties showed the same tendency. Thus it would appear that seedless fruits not only lack seeds, but some nutritional quantities.

Over the Fence

by H. K. MEYER

Mr. Little of the *National Farm* Chemurgic Council, Columbus, Ohio, writes us of an important development in the line of organic fertilizers. Six to eight corn-cob mills have been erected in the West supplying the war industry, but willing to change over to organic fertilizers and soil conditioners afterward. Even more important is the plan of using the greatest waste product of the wood industry, both mills and paper industry, for fertilizing. The *Chemurgic Digest* says that 12,000,000 tons of the valuable organic substance lignin collect every year or *more than all the tonnage of all the fertilizers used.* Robert S. Aries, Field Director of Northeastern Wood Utilization Council, recently said that about 20% of our total crop production can be attributed to fertilizer use. "If lignin is used on presently fertilized soils which need humus and organic matter, it is estimated that the efficiency of these soils would be raised about 20%." The wood wastes amount to—now guess . . . .—two thirds of all the wood cut. What a wonderful opportunity of returning necessary organics to the soil as happens under natural conditions!

—o—

Organic Soil Club, Inc. Box 15, Berkeley, Cal., is doing a fine job in helping our country get better. In its pamphlet, the statement occurs: "The codling moths become immune to the arsenate of lead." This sounds astounding, but naturally all living beings make adaptations to preserve themselves. The *Pennsylvania Farmer* of June 23, 1945, reports that tons of sprays hurled against the gypsy moth did not succeed in its elimination. This is why DDT is being applied. Yet the question still remains: What about the desirable insect life and the birds that thrive on it? Incidentally it has already been found that the cucumber family gets damaged by DDT dusting. But how would insects react? Possibly, there would be a very tough kind that becomes immune. For also Paul Shepard of the Missouri State Fruit Experiment Station says, in *Country Gentleman,* that the end is near for lead arsenate: "The codling-moth larvae are becoming immune to it."

—o—

Some readers have asked why we recommend phosphate rock, which is not an organic material. Well. . . Nobody says that *only* organic materials should be put in the soil. Where would our bones and teeth be if we did not take up lime, fluorine, phosphorus, and other such substances? Where large-scale farming goes on, minerals must also be returned to the soil. Phosphates are essential to all life processes. Phosphate rock is the best and most effective substance to supply phosphorus. For if we relied exclusively on organic products, such as bone

meal, it would not go around. The Experiment stations of Texas, Iowa, Illinois, and other states have always upheld the good old rock phosphate, and so shall we—as long as we have some phosphorus in our brain cells. But the soil biologist can tell you that phosphate rock will not kill the life in the soil. *This is what counts.*

—o—

The New Jersey Station says in Circular 470, written by Martin and Waksman, that Legumes or some other organic material high in nitrogen, such as green grass clippings or young rye plants, can be substituted for synthetic fertilizers. They say that a mixture consisting of 70 per cent straw or cornstalks and 30 per cent clover or fresh green grass makes a satisfactory combination. Well, if you added manure and a bit of soil and lime, you'd have compost rich in bacteria and even a better material. The two scholars point this out too. But we are glad to see Waksman, the eminent authority on Humus and Microbiology of the soil, advocate this method, though there is no reason for adopting it as a mere substitute. *This organic stuff is the real thing, the synthetics are the substitute.*

—o—

Our reader A. W. Carter from Lebanon, N. H., sends in an item from the Manchester *Union* on Dr. Stuart Dunn of the New Hampshire Experiment Station. Dr. Dunn says that a "disease" appeared in a California tomato field which was finally traced down to previous treatment of the land with sodium chlorate. This was meant to kill weeds, but its residues ruined later crops. Dr. Dunn must be a farsighted man as he looks at such a problem in the light of history: "One conclusion to be drawn from all this, according to Dr. Dunn, is that as our civilization gets old, we have less new land, and with the increasing complexity of treatments of old land, there is more danger of adverse effects on crops. This may apply to accumulated residues in soils from sprays and other measures applied to control fungus and insect pests as well as for weed control." And, we might add, as well as from strong synthetic fertilizers that affect soil structure and soil biology adversely.

—o—

How serious and earnest is this organic business? With some of us it is a very sacred thing. Of course, it is easy to poke fun at compost-making, but just read the book of Dr. Bennett on the soil conditions in South Africa! There they went ahead without organics, with burning and over-stocking, money-cropping and failing to rotate. Now they get often only a twentieth of what the fields yielded a decade ago. The soil has become *essentially lifeless.* But *compost* and animal manures have proved *highly beneficial.* Still, where a few years ago live streams were flowing, cattle are now dying from lack of water and grass. Sure, it is "easy to apply" chemicals; but chemicals do not restore the bacterial life in a soil that has lost it's organic content. Thus, *for us there can be no other way but the way of organics if we want America to live for many generations to come.* Out of the ever-growing circle of organic gardeners will come the spark that must light and enlighten everyone who loves the land and handles the soil.

—o—

I saw in some magazines an ad by *American Railroads*: "Wanted $93,000,000 worth of railroad ties." This is enough for 50,000,000 crossties. All right, they are needed now and for the war effort. But let us not forget afterward that we have

a peace effort, and that it takes many years and much work to grow 10,000,000 solid trees from which the next generation may cut their ties.

—o—

An expert on pigeons will love his birds so much that he pays little attention to the peas which the gardener fondles. So we are glad to have the gardener's angle too: "I must take exception to Mr. W. F. Hollander that 'doves are harmless in a garden, unless in enormous flocks.' I have seen one dove ruin five or six feet of a row of peas before I could get out of the house and drive it away. They love peas just as they are sprouting and will walk along a row and pull the seed out of the ground as fast as they can bob their heads. So far I have not found a satisfactory means of combatting them. Have tried treating the pea seed with 'crow repellent'. The doves seem to consider that some kind of relish or appetizer. Tried stringing twine along the rows near the ground with tin cans hung on them so that they strike together and make a noise. The doves would simply cock an eye at them and walk under and keep on pulling peas." (From a letter by E. B. Hubbell, Brattleboro, Vt.) This is such a good description of the rascals that we wanted other readers to share it. I know Mr. Hubbell is right. But when I want to scare birds away, I always put feathers around. Most birds seem to be scared of feathers, because they do not know what sort of a bird might pounce on them. They may not mind tin cans, but when it comes to their own family, the other birds, they cock their pretty heads and, after a slight pause, beat it.

Garden Calendar September-October

Medium Temperate Zone: Plant small onions, divide roots of herbs for propagation. Sow spinach for winter use, field salad, and late kale. Watch for frosts. Leave rootcrops in the ground until serious freezes commence. Parsnips become better in flavor if allowed to get a slight freeze. Warmweather crops, like tomatoes, must be taken in; the green fruit will ripen inside.

Sow flowers for spring blooming. Transplant, order and plant bulbs for spring-blooming.

This is the time to build coldframes and to attend to shrubs and fruit trees. The beekeeper watches out for the winter needs of his warmth-loving insects.

Hyacinths and other bulbs can be placed in pots for forcing inside. You can have flowers at Christmas, and beautiful fragrance in your house in the midst of winter.

Tubers are harvested, especially those subject to frost damage, e. g., horse radish, Jerusalem artichoke, dahlia, begonia. Dry thoroughly before storing.

Time to plant berries, to cut grape vines, to dig asparagus beds. Young trees can be set out, old ones trimmed and pruned.

Fertilize fruit trees, use your compost all over the garden and start by the middle of September the sowing of cover crops, e. g., rye, which will hold your soil and supply fertility for the spring compost business.

Fish growers consider leaving the ponds dry for the winter to reduce acidity.

Subtropical Zone: The time of the Northern spring sowing is on.

Old Rule: The fortnight before and after Saint Michael (Sept. 29) is the best sowing time for the farmer.

Reader's Correspondence

Send stamped self-addressed envelope for reply.

SOILLESS CULTURE

Q. What information can you give me about raising vegetables by the Hydrophonic method?

Geo. Oetjen,
Blue Island, Ill.

A. Leave it severely alone. In the first place it is very complicated and expensive, requiring considerable equipment, including pump machinery and constant attention to the solutions. It is the most "chemicalized" method there is. If all our food was raised in this manner, I believe the race would die out in a few generations. Our resistance to disease would decrease to such an extent that some plague would play havoc with the population. It is possible that some form of "soilless" culture can be worked out which would use organic matter cheapest and most natural method exclusively, but in our opinion, the is right in the good old soil.

—o—

MUCKLAND

Q. I have a piece of land about 2 acres, one half of which is only about 5 ft. above water level of a small lake, which it borders. It is black muck land. I have drained, cleaned and worked a piece about 50 x 75 ft. The weeds grew some 4 and 5 ft. high. For the past 3 seasons I have grown some very good vegetables on this. The higher part of this lot is about 50 ft. above water level. Would you advise to mix some of this dirt with the muck land? Would it improve the soil for general vegetable gardening?

John H. Toornman,
Kalamazoo, Mich.

A. While such muck land may be rich in a manner of speaking, it may lack some important elements. Well-made compost should be applied each year. It would also be advisable to add and mix in some of the upper section of soil each year. If you can mulch your vegetables with straw and then spade this in for a few years you will gradually improve the quality of the muck. Add liberal dressings of ground limestone too.

You may be able gradually to bring down part of the upper soil to the muckland if for a period of years *you start spading at the bottom and throwing the earth downward.* I have used this system and managed to terrace a sloping piece of ground and gradually to build up the lower level. This should be the best method of mixing the soils gradually, which will allow the building up of top soil on the higher part.

—o—

MULCH AND NITROGEN

Q. Have been wanting for some time to tell you that "Organic Gardening" is the real treasure of all publications. Not only is it chuck full of valuable information but its style makes for delightful reading. I have a small farm—28 acres—just getting started in 1943

from "scratch" having to clear and build as far as we could under restrictions. But we are adhering to organic principles.

We are planning on berries as our staple crop, being ideally situated for them. Have blackberries, strawberries, red raspberries and boysenberries.

I read in another publication that when mulching, nitrogen should be introduced to the soil before placing the mulch as in the outset the mulch draws much nitrogen from the soil. Is this true? If so, what method is best to use in putting nitrogen to the soil?

Miss Elizabeth Allen,
Florissant, Mo.

A. Mulches in themselves are not sufficient. First a dressing of compost is used. Then the mulch is applied over it. The compost is rich in nitrogen.

—o—

VIRGIN SOIL

Q. Some time ago I purchased 2½ acres of virgin land. This land I carefully picked out as it has four feet deep of rich brown soil on which I intend to build a home as soon as material is available and raise flowers; not just flowers but the best flowers possible.

In Organic Gardening in the article "The Control of Eelworm" by Sir Albert Howard, C. I. E., it states: "Its use, as was to be expected, was not usually beneficial on virgin soil."

If compost is not beneficial on *virgin soil* will you kindly let me know how best to put this land into a high state of cultivation? I intend to have a bulldozer clean up the land this coming fall after which I intend to have it plowed.

James E. Mason,
Seattle, Wash.

A. The chances are that your virgin soil is acid and will have to receive liberal dressings of ground limestone, except in spots where you would want to preserve the acid condition for certain acid-loving flowers. After you begin cropping, you would then want to apply compost so as to maintain the fertility.

—o—

FISH POND FERTILIZER

Q. Sometime ago I wrote you with reference to the best non-chemical fertilizers for use in fish ponds. You suggested Phosphate Rock from the Ruhm Phosphate & Chemical Company. I contacted this firm and will order from them. I have decided to use along with the Phosphate Rock some bone meal and dried blood, if I can get it. It seems that I have seen advertised somewhere a RAW bone meal—do you know anything about this? Would also like to know where dried blood, or blood meal, can be procured. If you will give me this information, along with your suggestion as to how much of each to use per acre—I will greatly appreciate it.

Grady W. Coble,
Greensboro, N. C.

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A. As you know, the question of fertilizing fish ponds depends on the natural fertility of the pond. The first thing is to cut the grasses and sedges and other weeds early in spring and, if possible, to compost them. This material, when mature, can then be added to the pond. Compost is made by mixing such material (six inch layers) with animal manure, (two inch layer), and a sprinkling of lime and earth, repeating these sandwiches until you have a heap about four or five feet high. This compost should be mature after three months and can be placed in the water. An acre of water area should receive about 120 pounds each of nitrogen, phosphorus and potash. The potash is taken care of through this compost material.

Phosphate rock could be applied at about 300 pounds an acre if you also use some organic phosphorus. 200 pounds ground raw bone, which is better than steamed bone meal for fisherman's purposes, will contain about 50 pounds of phosphorus which is very essential for fish growth. It may also be used as direct fish food and we should suggest that you add to the phosphate rock approximately 200 pounds of ground raw bone, sprinkling it throughout the spring near the shore.

Dried black blood, less valuable than red but probably the only one you can get, is both plant and fish food. A 100 pound bag contains 6 pounds of nitrogen and you see from that you could add of it almost a ton per acre in the course of a year. Much, however, depends on the acidity of the water and the natural fertility of the pond and we should advise to take up special problems with the Department of Fisheries of the state.

Dried blood and bone meal may

be obtained from fertilizer dealers in your vicinity. Write to Swift & Company, Chicago, for the nearest address of one of their dealers handling these materials. As we proceed towards reconversion such stuff will become more plentiful.

—o—

GRUBS IN THE COMPOST HEAP

Q. We find white grubs in the leaf mold and compost. How do they differ from earthworms?

S. M. Morris,
Hamden, Conn.

A. Earthworm eggs or capsules are small and ovally globular. They are about a sixteenth of an inch in diameter. They differ greatly from insect grubs and larvae. Usually the white grubs seen in the compost heaps are those of the common fly and can be completely ignored. Most of these do not hatch because flies are rarely seen around well-made compost heaps, especially where care is taken to see that a layer of earth at least two inches thick completely covers the heap. The earth that is applied in the interior of the heap should be only a mere sprinkling of about ⅛ of an inch.

White grubs of insects can easily be distinguished by their insect heads and we have never found them to be a problem in compost-making. If they are in the interior of the heap the heat will kill them off. When a compost heap is turned care should be taken to see that the outside parts are placed on the inside, thus taking care of such grubs as well as weed-seeds.

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CHICKENS AND WORMS

Q. I have read that one should not let chickens eat earthworms as they contain the parasites or germs which cause chicken diseases. Also that other bugs and worms and grass-hoppers contain these germs. I always thought worms, bugs and such which chickens eat would be good for them. Would the danger of disease germs be more from earthworms in soil where chicken manure has been used?

Naomi Wootton,
McCook, Nebraska.

A. The minute earthworms are mentioned to some farmers it brings to mind negative connotations. The word "worms" is anathema to them. Some farmers actually kill earthworms when they encounter them in their gardening. They do not distinguish between earthworms, cutworms and the host of other crop-destroying pests. This question is often raised where earthworms are fed to chickens. As far as is known chicken parasites do not survive in earthworms, that is, the earthworm is not an intermediary host for parasites. This question was submitted to many persons who have had years of experience with chickens and earthworms and there is absolutely no evidence that there is any such danger.

It is also a fact that earthworms in their travels through the soil eat and destroy the eggs of many dangerous insect pests and thus cleanse the soil of dangerous sources of infestation. Regarding your last question, I would not, on general principles, use raw chicken manure as a fertilizer where chickens are going to be "on range." Rather compost it first with the addition of green matter.

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